

**Amazon's Parallax 3D Mobile Device: A summary of
associated privacy risks.**

*By Alexander Hanff
Think Privacy Inc.*

Introduction

Several press organisations are currently reporting that Amazon will be entering the mobile phone sector early this summer and that its first device will feature a Parallax 3D UI which utilises four infrared cameras around the display to track head and eye movements in order to create a holographic visual effect.

Whereas the stated purpose for this technology would seem to be relatively innocuous, one has to also understand that such technology causes significant concern as a risk to privacy.

Given that eye tracking is a relatively mature experimental method (for instance, it has been used in developmental psychology for decades) it does raise a serious question about other uses of Amazon's technology – the most obvious being, will Amazon use this technology to monitor what people are looking at on their devices?

Tracking Eye Movements

Tracking eye movements has been a useful experimental method for many years most notably in developmental psychology where eye trackers are used frequently.¹²³

For example eye tracking in infants can be used to measure:

1. *Allocation of attention and interest*
2. *Visual perception related to understanding and recall*
3. *Ability to recognise motion signals*
4. *Development of control of action*
5. *Social interaction characteristics*
6. *Oculomotor functions*
7. *Language acquisition*

But it is not just in experimental psychology where eye tracking is proving to be a useful technology – there is an increasing amount of research being published with regards to the tracking of eye movement to measure consumers' reactions to advertising.⁴

¹ Frank, M.C., Amso, D., Johnson, S.P., 2014. Visual search and attention to faces during early infancy. *Journal of Experimental Child Psychology* 118, 13–26.

² Southgate, V., Vernetti, A., 2014. Belief-based action prediction in preverbal infants. *Cognition* 130, 1–10.

³ Handl, A., Mahlberg, T., Norling, S., Gredebäck, G., 2013. Facing still faces: What visual cues affect infants' observations of others? *Infant Behavior and Development* 36, 583–586.

⁴ Eye-Tacking Technologies Are About To Make Advertising Even More Invasive – Tarun Wadhwa, Forbes 2013. <http://www.forbes.com/sites/tarunwadhwa/2013/05/08/with-recent-advances-in-eye-tracking-advertising-set-to-become-even-more-invasive/>

How does an Eye Tracker work?

“Most commercial eye-tracking systems available today measure point-of-regard by the ‘corneal-reflection/pupil-centre’ method (Goldberg & Wichansky, 2003). These kinds of trackers usually consist of a standard desktop computer with an infrared camera mounted beneath (or next to) a display monitor, with image processing software to locate and identify the features of the eye used for tracking. In operation, infrared light from an LED embedded in the infrared camera is first directed into the eye to create strong reflections in target eye features to make them easier to track (infrared light is used to avoid dazzling the user with visible light). The light enters the retina and a large proportion of it is reflected back, making the pupil appear as a bright, well defined disc (known as the ‘bright pupil’ effect). The corneal reflection (or first Purkinje image) is also generated by the infrared light, appearing as a small, but sharp, glint.”⁵

It is not the purpose of this paper to give a detailed history and scientific analysis of eye movement tracking, but it is clear that the technology is mature and being used to measure reactions to advertising.

What are the privacy risks with the Amazon phone?

Given the current capabilities of eye tracking technologies and the widely reported details that the upcoming Amazon phone will include four infrared cameras around the screen in order to facilitate the parallax 3D user interface – it should also be noted that this same technology can be used to track how a user of this device views content delivered by it.

For example, given the accuracy of the technology it is not just conceivable, but this author feels it is inevitable that the device will be used to determine which areas of the display the user is looking at; for how long; whether they return their gaze to a specific area given a specific stimulus etc.

Ultimately this allows those in control of the technology (Amazon in this case) the ability to build a profile of things which interest the user – similar to behavioural profiles generated by cookie tracking.

Currently, Amazon only has the ability to track users either within their own web site or third party sites that use content generated on Amazon’s servers (and therefore able to update Amazon cookies, local storage or other currently used tracking technologies). By entering the mobile market with this technology, Amazon would be in a position to collect data on all web sites that a device user visits and analyse how that user is interacting with these web sites.

Amazon would then be in a position to either send the data back to their own servers (given they will be in control of the Operating System on the device) or sell access to that data via an Application Programming Interface (API) to third parties such as data brokers, web site owners or advertising networks.

⁵ Poole, A., Ball, L.J., Lancaster University. Eye Tracking in Human-Computer Interaction and Usability Research: Current Status and Future Prospects (<http://www.alexpoole.info/blog/wp-content/uploads/2010/02/PooleBall-EyeTracking.pdf>)

As such the exact same privacy risks exist for this technology as any other behavioural tracking technology such as cookies, deep packet inspection, viewing habits etc.

Furthermore, given Amazon's history of behavioural analytics within their own consumer facing assets, it would seem naïve to assume that Amazon would not take advantage of this technology to further their business interests in the advertising sector.

Conclusion

There is currently little to no regulation in place to deal with this type of intrusive technology and in fact even if there were it would be easily circumvented by Amazon simply including contractual terms to permit them to use the technology in this way as part of the Terms of Use a consumer agrees to when they purchase such a device.

It is also highly unlikely that many consumers will even be aware of the risks this technology poses towards their privacy and in fact this author believes that most consumers would be dazzled by the innovative parallax 3d user interface (the "wow factor") without even considering what other uses the technology may have or be capable of.

Further, even if Amazon do not intend to use the technology in this way – given that the operating system is reportedly going to be based on Android, it may be possible for third parties to write applications ("apps") for the device which are able to use the included hardware in this intrusive manner.

It is therefore critical that more research be done on this issue and that regulators are made aware of the risks as well as raising awareness with consumers and seeking Amazon to make public all planned uses for this technology in a transparent and coherent manner.